MARINE REVIEW.

VOL. XI. CLEVELAND, O., MARCH 7, 1895. No. 10.

Finest of Long Island Sound Ships.

TWIN-SCREW STEEL STEAMER CITY OF LOWELL, FOR WHICH A SPEED OF 23.4 MILES AN HOUR IS CLAIMED—DETAILED DESCRIPTION OF A PALACE PASSENGER BOAT.

Among the fleet of Long Island sound palace steamers, the City of Lowell, which is operated on the New York and New London route, by the Norwich and New York Transportation Company, is the latest and most notable addition. Although this steamer, which was built by the Bath Iron Works of Bath, Me., has previously been described in the REVIEW, the general interest attending her performance will probably warrant publication of the very complete description of her that is given here. According to reports from builders and owners of this boat, she made, on Oct. 9 last, the fastest trip ever made on Long Island sound, the time from wharf to wharf, New York to New London, being given as 5 hours and 32 minutes; distance, 122 statute miles; average speed, entire run, 22.04 statute miles per hour; sustained speed for 2 hours and 24 minutes during a part of run, 23.4 miles per hour; average revolutions 138.5 and maximum 147.

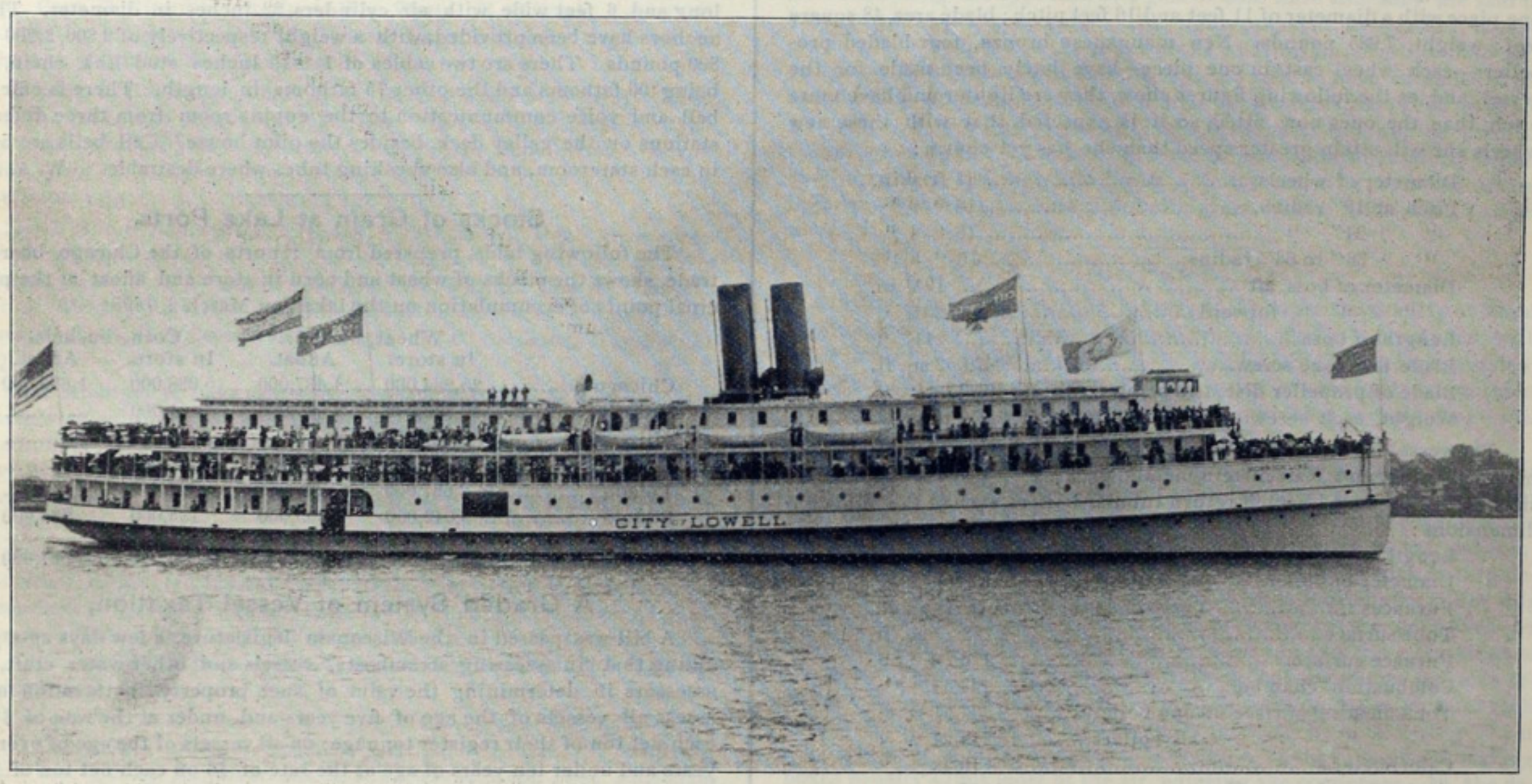
The maximum speed reported for other fast sound steamers like the Priscilla, Richard Peck and Puritan is 21 to 21.8 statute miles per hour. The City of Lowell was, at the time of this trial, in good condition for showing speed. She had just come off the dry dock, and her bottom was in good condition. She had been in commission not quite three months. When her manganese wheels are fitted, the builders claim she will attain yet greater speed.

The City of Lowell is in reality an enlarged and improved Richard Peck, and was designed by Mr. A. Cary Smith of New York, to excel in power, speed, capacity and elegance any screw boat on the American coasts. The principal features of the hull are:

Length over all	336 ft.	0 in.
Length L. W. L	319 "	10¾ "
Beam	49 "	6 "
Extreme breadth over guards	66 "	1 "
Depth of hold	17 "	7 "
Mean draft, L. W. L	13 "	0 "
Freeboard, amidships	7 "	9 "
Ratio, length W. L. to beam	6.46 to 1.	
Displacement	2,380 tons.	
Total height, top of dome to base line	51 ft.	1½ in.
" " " " stack " " "	80 "	
Tonnage, gross	2,975.04.	
" net	1,877.28.	
Tons per inch, L. W. L	25.19.	
Area of immersed midship section	472 32 sq. ft.	
" " load water plane	10,579.6 " "	
Coefficient of fineness of displacement	.407.	
" " " " mid section	.745.	
" " " " load water plane	.674.	
Area of wetted surface	13,584.5 sq. ft.	
Number of watertight compartments	5.	
Total number of staterooms for passengers	147.	
" " " " officers	17.	
" passenger berth accommodation	615.	
" crew or complement	107.	
Freight capacity	650 tons.	
Coal bunker capacity	90 "	

The vessel is staunchly built, the material and workmanship being of the highest possible order. She has five decks, named, respectively, lower, main, saloon, galley and hurricane. The lower deck forward and aft of the machinery spaces is devoted entirely to the crew and free berth passenger accommodation, there being seventy-two free berths forward and 102 aft, while forward of all the crew, table waiters, etc., sixty-three in number, are berthed. Some 200 feet of the main deck amidships is devoted exclusively to freight and is entirely separated from the living spaces in all respects. The carrying capacity of this freight space is 101,500 cubic feet. On the after part of this deck is a commodious social hall, just aft of which is a hallway containing a handsome staircase leading to the saloon deck; also washrooms and offices and staterooms for the pursers and freight clerk. Aft of all is situated the ladies' cabin, containing six double-berth staterooms, twenty-seven free berths and the necessary toilet rooms, etc. At the forward end of this deck is placed the Hyde patent steam windlass and the Williamson steam steerer, berthing accommodation for the porter, firemen and coal passers; mess rooms for the crew and firemen, and the bar room, with stairs from here leading to the saloon deck.

The saloon deck is devoted entirely to the accommodation of first-class passengers, there being eighty-two double-berth staterooms and twenty-four rooms fitted as bridal chambers, with brass bedsteads and handsome furnishings, on this deck. About midships are the engine and boiler hatch casings, and the former is so arranged that the passengers



TWIN SCREW STEAMER CITY OF LOWELL—LONG ISLAND SOUND PASSENGER SERVICE.

can see right into the engine room and watch the working of the powerful machinery. The dining room, kitchen, pantry, cafe, smoking room and officers' quarters are on the upper or galley deck; also thirty-five double-berth staterooms. The furnishing, painting and decorating of the vessel throughout is in the latest improved and most artistic and luxurious style, the saloons being finished in delicate tints, well ornamented with gold leaf. Carton pierre decorations, furnished by J. T. Hall & Co. of New York, were used throughout.

The propelling power of the City of Lowell was designed by Mr. Charles E. Hyde of the Bath Iron Works, a man well known as having designed and built the first triple-expansion engine in America, viz: that for the steam yacht Meteor, now known as Golden Rod. The machinery consists of two independent sets of vertical, inverted, direct acting, triple-expansion engines driving twin screws. The cylinders are 26 inches, 40 inches and 64 inches in diameter, with a stroke of 36 inches, the high pressure being fitted with a piston valve, and the intermediate and low pressure cylinders with double ported slide valves. The total I. H. P., including all auxiliaries, is 4,400 when the main engines are making 125 revolutions per minute—a piston speed of about 750 feet. The cylinders are supported by heavy wrought iron columns in front and cast iron columns behind. The piston rods are of steel, while the connecting and working rods generally are of wrought iron. The air pumps are worked from the low pressure crosshead, and are of 27 inches diameter and 12 inches stroke. The condensers form part of the framing at the back of the engine and are each 19 feet 6 inches long, 70 inches high and 37¼ inches wide, with a cooling surface of 3,387 square feet. The crank shaft is 11¾ inches diameter, and is made of wrought iron, with steel crank pins. The propeller wheels, as now fitted, are of cast iron, four-bladed in one piece with a diameter of 11 feet and 16 feet pitch; blade area, 48 square feet; weight, 7,085 pounds. New manganese bronze, four-bladed propellers—each wheel cast in one piece—have lately been made for the vessel, and, as the following figures show, they are lighter and have more pitch than the ones now fitted, so it is expected that with these new wheels she will attain greater speed than she has yet shown:

Diameter of wheels	11 ft. 0 in.
Pitch at 18″ radius	16 " 0 "
" " 24″ "	16 " 4 "
" " 36″ to 66″ radius	16 " 8 "
Diameter of boss, aft	19¾ in.
" " " forward	23¼ "
Length of boss	24½ "
Blade area, one screw	47.552 sq. ft.
Blade of propeller disc, two screws	402.12 " "
Weight, each screw	6,050 pounds.

The vessel is fitted with Worthington pumps throughout, Hinckley's piston packing, and Katzenstein metalic packing. Steam is supplied by six steel single-ended Scotch return tubular boilers, each of the following dimensions:

Length of boiler	12 ft. 5½ in.
Diameter of boiler	13 " 6 "
Furnaces	Three of 43 in. diam., corrugated.
Tube surface	2,222 sq. ft.
Furnace surface	170 " "
Combustion chamber	144.54 " "
Total heating surface of one boiler	2,536.54 " "
" " " " all boilers	15,219.24 " "
Calorimeter	10.48 " "
Grate area of one boiler	75 " "
" " " all boilers	450 " "
Proportion, grate to heating surface	1 to 33.82.
" calorimeter to grate	1 to 7.15.
Steam space	310 cubic ft.
Length of grate	6 ft. 8 in.
Width " "	3 " 9 "
Working pressure	165 pounds.
Number of tubes	369.
Diameter of tubes	2½ in.
Length " "	9 ft. 2 "
Weight of water	24 tons.

The boilers are placed three on the starboard and three on the port side of a boiler room the width of the ship and 44 feet long, and two lofty smoke pipes, 9 feet by 7 feet 6 inches, carry off the refuse gas and smoke. The engines occupy 24 feet of the vessel's length, and the coal bunkers 6 feet, therefore the engines, boilers and coal occupy 74 feet of the vessels' length amidships. The coal bunker capacity is 90 tons, but the vessel consumes only 48 tons on each round trip, a distance of 245 miles. One of the features of the fire room, which is 12 feet wide, commodious and well ventilated, is Horace See's patent hydraulic ash ejector, with which it is equipped. By this ejector the ashes accumulated during a watch are literally washed overboard by the water from a pump in the engine room, thus doing away with the tiresome and dusty method usually in vogue.

A donkey boiler of the locomotive type is fitted on the main deck in the boiler hatch, for auxiliary purposes, such as steam heating, hoisting, pumping, etc.

Diameter of "donkey" boiler	5 ft. 0 in.
Total length of "donkey" boiler	11 " 10⅜ "
Number of tubes	118.
Size " "	2½ in. diam.
Length " "	5 ft. 10½ in.
Size of fire box	4 ft. 9 in. by 4 ft. 6¾ in.
Two furnace openings	1 " 4 " by 1 " 3 "
Steam pressure	100 pounds.

The electric plant is of two units, each independent and consisting of a thirty kilowatt direct current incandescent dynamo of the bipolar Edison type, and a 70 H. P., 11 inches by 14 inches Edison system straight line engine. Each unit is capable of lighting the entire ship, there being 694 sixteen-candle-power lights; also a powerful search light of the most approved pattern on the pilot house. The electric plant is placed in the after hold in direct communication with the main engine room, and the dynamos and engines are connected by a belt. The total weight of the two units, engines and dynamos, is 24,390 pounds. The space occupied by each engine is 9 feet 6 inches long and 5 feet 2 inches wide, and by each dynamo 6 feet 1½ inch long and 4 feet 8⅛ inches wide.

The vessel is fitted with the following boats, supplied by Thomas Drein & Sons of Wilmington, Del.: Six double-ended metallic life boats, 22 feet long, 6 feet 2 inches beam and 2 feet 2 inches deep; two square stern metallic life boats, 20 feet long, 6 feet beam and 2 feet 2 inches deep; one square stern wood dinghy, 15 feet long, 4 feet 2 inches beam and 1 foot 8 inches deep. There are in addition, three life rafts, 16 feet long and 6 feet wide, with air cylinders 22 inches in diameter. Three anchors have been provided, with a weight respectively of 2,800, 2,200 and 800 pounds. There are two cables of 1 9-16 inches stud link chain, one being 90 fathoms and the other 75 fathoms in length. There is efficient bell and voice communication to the engine room from three different stations on the galley deck, besides the pilot house. Call bells are fitted in each stateroom, and also speaking tubes where desirable. W. A. F.

Stocks of Grain at Lake Ports.

The following table, prepared from reports of the Chicago board of trade, shows the stocks of wheat and corn in store and afloat at the principal points of accumulation on the lakes on March 2, 1895:

	Wheat, bushels.		Corn, bushels.	
	In store.	Afloat.	In store.	Afloat.
Chicago	25,264,000	1,437,000	5,028,000	1,673,000
Duluth	10,756,000	85,000	1,000	.....
Milwaukee	656,000	.....	.....	.....
Detroit	1,318,000	257,000	126,000	.....
Toledo	2,687,000	299,000	926,000	.....
Buffalo	3,042,000	305,000	135,000	684,000
Total	43,723,000	2,383,000	6,216,000	2,357,000

A Graded System of Vessel Taxation.

A bill was passed in the Wisconsin legislature, a few days ago, providing that "in assessing steamboats, vessels and other water craft, the assessors in determining the value of such property for taxation shall assess all vessels of the age of five years and under at the rate of $8 on each net ton of their register tonnage; on all vessels of the age of over five years and under ten years of age at the rate of $6 on each net ton of said tonnage; and on all vessels over ten years of age at the rate of $5 on each ton of said tonnage; and in case there be no tonnage registered, then at such actual tonnage as such steamboat, vessel or water craft has as near as the same can as be ascertained." The act goes into effect immediately.

Lake Superior Mining Institute.

Secretary F. W. Denton of the Lake Superior Mining Institute announces that the following papers will be discussed at the meetings of the institute, which are to be held, this week, in Minnesota mining towns, while a trip of inspection is being made over the Mesabi range: "The Relation of the Vein at the Central Copper Mine, Keweenaw County, Mich., to the Kearsarge Conglomerate;" "Open Pit Mining and its Advantages, with Special Reference to the Mesabi Deposits;" "The Geology of the Eastern Mesabi Range;" "Crushers for the Hard Ore Hematites of Lake Superior;" "Pumping." As much open pit mining was done in the early days in Michigan, some of the members are expected to give the difference in the cost of mining in open pits and underground.

"SAILING DIRECTIONS FOR LAKE SUPERIOR, ST. MARY'S RIVER AND STRAITS OF MACKINAC" IS A PUBLICATION RECENTLY ISSUED BY THE UNITED STATES HYDROGRAPHIC OFFICE. IT IS FAR IN ADVANCE OF PUBLICATIONS OF THE COAST PILOT KIND. PRICE $1. ADDRESS MARINE REVIEW, 516 PERRY-PAYNE BUILDING, CLEVELAND, O. WE HAVE NO HESITANCY IN RECOMMENDING THIS BOOK.

Appointments of Masters and Engineers.

Close, G. W., Berlin Heights, O.: Steamer—C. W. Elphicke, Capt. F. A. Bailey, Engineer John Smith.

Roby Transportation Company, Detroit, Mich.: Steamer—Geo. W. Roby, Capt. Jno. Duddleson, Engineer J. Collins.

Jackson, G. K., Bay City, Mich.: Steamer—D. Leuty, Capt. John Randell, Engineer M. Owen. Schooners—Celtic, Capt. John Lovell; R. Bottsford, Capt. Chas. K. Jackson; G. K. Jackson, Capt. Curtis Jackson.

Great Northern Transit Company, Collingwood, Ont.: Steamers—Majestic, Capt. P. M. Campbell, Engineer W. Lewis: Pacific, Capt. R. D. Foote, Engineer J.W. Aston; Atlantic, Capt. James Wilson, Engineer———.

Mutual Transportation Company, Cleveland: Steamers—Corsica, Capt. Wm. Cumming, Engineer Wm. Stean; Corona, Capt. John Dunn, Engineer F. C. Stoeber; Cambria, Capt. Stephen Murphy, Engineer Andrew Haig.

Vulcan Transportation Company, Detroit, Mich.: Steamers—Forest City. Capt. Joseph Sanders, Engineer John Erving; R. J. Hackett, Capt. Henry Sanders, Engineer Daniel Harkins. Schooners—William McGregor, Capt. John Hochrath; H. H. Brown, Capt. Thos. Sanders.

Republic Iron Company, Cleveland: Steamers—Republic, Capt. J. A. Landfair, Engineer Wm. Lowe; Specular, Capt. E. T. Rattray, Engineer Lloyd; Continental, Capt. Chas. Hinslea, Engineer John Smith. Schooners—Magnetic, Capt. Wm. Megarvey; Grace Holland, Capt. Harry Rogers.

Northwestern Transportation Company, Detroit, Mich.: Steamers—Harvey H. Brown, Capt. E. C. Gatfield, Engineer John H. Hand; S. R. Kirby, Capt. D. Girardin, Engineer Wm. Watts; E. M. Peck, Capt. C. H, Chamberlin, Engineer John H. Foster; Fayette Brown, Capt. Jos. W. Nicholson, Engineer Nic. Anderson.

Corning & Edgar, Saginaw, E. S., Mich.: Steamers—C. H. Green, Capt. Charles Little, Engineer John Lee; Oscoda, Capt. Geo. W. Ryan, Engineer Robert Spears. Schooners—Our Son, Capt. Wm. A. Edgar; Genoa, Capt. D. C. Ryan; Ida Corning, Capt. P. H. Edgar; C. G. King, Capt. Peter Edgar; A. C. Keating, Capt. Patrick Ryan.

North Shore Navigation Company, Collingwood, Ont.: Steamers—City of Collingwood, Capt. W. J. Bassett, Engineer, C. Robinson; City of Midland, Capt. F. X. Lafranc, Engineer W. Whipps; City of London, Capt. E. Walton; Favorite, Capt. Geo. Playter, Engineer J. Smith; new passenger boat under construction, Capt. A. C. Cameron, Engineer D. McQuade.

Lake Michigan & Lake Superior Transportation Company, Chicago: Steamers—Manitou, Capt. Allan McIntyre, Engineer R. L. Peck; City of Duluth, Capt. Donald MacLean, Engineer Henry Chalk; City of Traverse, Capt. J. M, Twichell, Engineer S. W. Armstrong; Peerless, Capt. H. C. Page; Engineer J. R. Bennett; Jay Gould, Capt. Joseph White, Engineer, A. P. Williams.

Menominee Transit Company, Cleveland: Steamers—Norman, Capt. S. Stratton, Engineer Clement Clark; Saxon, Capt. Wm. C. Goodsell, Engineer Geo. E. Averell; German, Capt. F. W. Stenton, Engineer Wm. H. Lawrence; Briton, Capt A. C. Chapman, Engineer O. H. Gilmore; Grecian, Capt. Jas. Walsh, Engineer A. T. Prince; Roman, Capt. A. J. Greenly, Engineer S. A. Wells.

Hawgood & Avery Transit Company, Cleveland: Steamers—S. S. Curry, Capt. Geo. Robarge, Engineer Jas. Norton; Geo. F. Williams, Capt. Thos. C. Ellis, Engineer Jas. Lyons; Servia, Capt. Fred Ahlstrom, Engineer Henry Narjal; Geo. W. Morley, Capt. Frank Elliott, Engineer ———. Schooners—H. A. Hawgood, Capt. Jas. Owen; Moravia, Capt. Louis Bang; Frank D. Ewen, Capt. Wm. Summerville.

Union Steamboat Company, Buffalo, N. Y.: Steamers—Chemung, Capt. Walter Robinson, Engineer, Henry C. Jordan; Owego, Capt. John Byrne, Engineer Charles W. Wall; Tioga, Capt. W. P. Garden, Engineer George Fritsche; H. J. Jewett, Capt. D. O. Bordeaux, Engineer William Skelton, Jr.; Rochester, Capt. J. M. Clossey, Engineer N. Johnson; New York, Capt. Joseph Frawley, Engineer Joseph Howlett.

Detroit & Cleveland Steam Navigation Company, Detroit, Mich.: Steamers—City of Detroit, Capt. A. J. McKay, Engineer Wm. S. Huff; City of Cleveland, Capt. Dugald McLachlan, Engineer John Sargeant; City of Alpena, Capt. Matthew Lightbody, Engineer ———; City of Mackinac, Capt. H. J. Slyfield, Engineer Wm. McDonald; City of the Straits, Capt. Duncan McLachlan, Engineer James Middleton.

Whitney Transportation Company, Detroit, Mich.: Steamers—Merida, Capt. W. H. Hutcheson, Engineer J. Balfour; Tampa, Capt. John Ivers, Engineer Chas. Murrett; Mecosta, Capt. John Leonard, Engineer Owen Williams; Lansing, Capt. C. G. Ennis, Engineer Jos. Coveyeau; D. C. Whitney, Capt. D. Critchet, Engineer Jos. Lacey; Nipigon, Capt. A. C. May, Engineer Ed. Egan. Schooners—Ashland, Capt. Geo. Dennis; Wayne, Capt. Benj. Cole; Melbourne, Capt. Geo. Cooper.

Fitzgerald, R. P. & Co., Milwaukee, Wis.: Steamers—Philip D. Armour, Capt. F. D. Chamberlin, Engineer J. R. Mason; Wiley M. Egan, Capt. Fred Howe, Engineer John McCaffrey: R. P. Fitzgerald, Capt. Leslie E. Boyce, Engineer B. McNeill; John Plankinton, Capt. Lewis. H. Powell, Engineer Wm. Fell; Denver, Capt. P. Christenson, Engineer John Smith; Omaha, Capt. Hawley M. Boyce, Engineer Alex. Staley; Pueblo, Capt. Duncan Stalker, Engineer Jos. Jamieson; Topeka, Capt. Albert Gibbs, Engineer John Cantwill.

Around the Lakes.

On the opening of navigation a wind-signal display station of the weather bureau will be established at Fairport, displaying day signals only, repeating the signals ordered for Cleveland. The signals will probably be displayed above the dock office of J. R. Irwin.

The hydrographic office has issued the new rules of the road for the lakes in pamphlet form, and masters of lake vessels desiring copies of same can secure them by applying to the Cleveland or Chicago branch offices, or by addressing the general office in Washington.

Ferdinand Schlesinger of Chapin mine fame has been in Cleveland during the week. He has spent some time in the gold and silver mining districts of Mexico, but it is not probable that his operations have been as successful as scattering newspaper notes would indicate.

Notice is given that with the establishment of the new Manhattan range lights in Maumee bay, upon the opening of navigation next season, the Maumee outer, middle and inner range lights on the west side of the bay and on the southeast bank of the river will be discontinued.

Experiments have finally been made in Chicago with a search light for announcing the approach of a gale or cold wave and they are said to have proven quite successful. The light, operated by weather bureau officials, was mounted on the tower of the Auditorium. A white flash was succeeded by a green light and the rays are said to have extended over a circle forty miles in diameter. Similar experiments have been made in New York. According to present plans the signals will not be used as rain or snow signals. The red light alone will indicate easterly winds and hurricanes, and the white light, a frosty morning; red and white, high westerly winds; a flash light with green shade, will indicate a cold wave.

Air Pumps.

In the latest number of the Journal of the American Society of Naval Engineers a very interesting discussion on air pumps is concluded with a few notes from Chief Engineer G. W. Baird, U. S. N., and Past Assistant Engineer F. H. Baily, U. S. N. The discussion has brought out considerable valuable data on the subject, as well as a number of designs of independent air pumps.

"The amount of water to be pumped from a condenser by the air pump is so small in comparison with the amount of air," says Engineer Baily in one part of the discussion, "that it need hardly be considered in determining the required displacement of the air pump piston per minute. The amount of air depends largely upon leakage, which in turn depends upon the care with which the machinery is looked after. For this reason an independent air pump is to be preferred to the one driven by the main engine, since its speed can be varied to suit the necessities of the case. A good average value for independent air pumps for men-of-war is 0.2 cubic feet displacement of air pump piston per minute for each indicated horse power. This amount requires to be increased by 50 per cent. when the pump is attached to the engine. Leaky piston rod stuffing boxes usually admit most of the air entering the condenser. In the design of the pump, care should be taken to avoid any pockets in which the air can collect without being expelled at each stroke. The most efficient pump is single acting and vertical, in which the clearance can be kept full of water. The efficiency of a double acting pump may be expected to begin falling off when piston speed of from 100 feet to 200 feet per minute, depending upon the length of the stroke, is exceeded. Vertical single acting pumps give good results with piston speeds of from 400 feet to 500 feet.

"A good air pump should maintain a vacuum within one inch of that due to the temperature of the condenser. With a temperature of air pump discharge of 120 degrees, 25.6 inches would be a good vacuum. The efficiency would probably not exceed 50 per cent., as about ½ inch of air would be required to raise the valves and overcome friction. Doubling the size of the pump would diminish the pressure of air above that required to lift the valves just one-half, and the vacuum would be increased but ¼ inch. Similarly, with a pump of half the capacity the vacuum would fall off but ½ inch. Too large a pump is more objectionable than too small a one, as, besides the unnecessary weight, space and steam demanded, it is more irregular in its action; the valves fail to lift for some strokes, and then the pump is flooded. A capacity so small as $\frac{1}{15}$ cubic foot per minute per indicated horse power has worked well in a single acting vertical pump. The velocity of flow through the bucket valves should not exceed 1,000 feet per minute. Foot valves should be of the same area as bucket valves, and delivery valves larger."

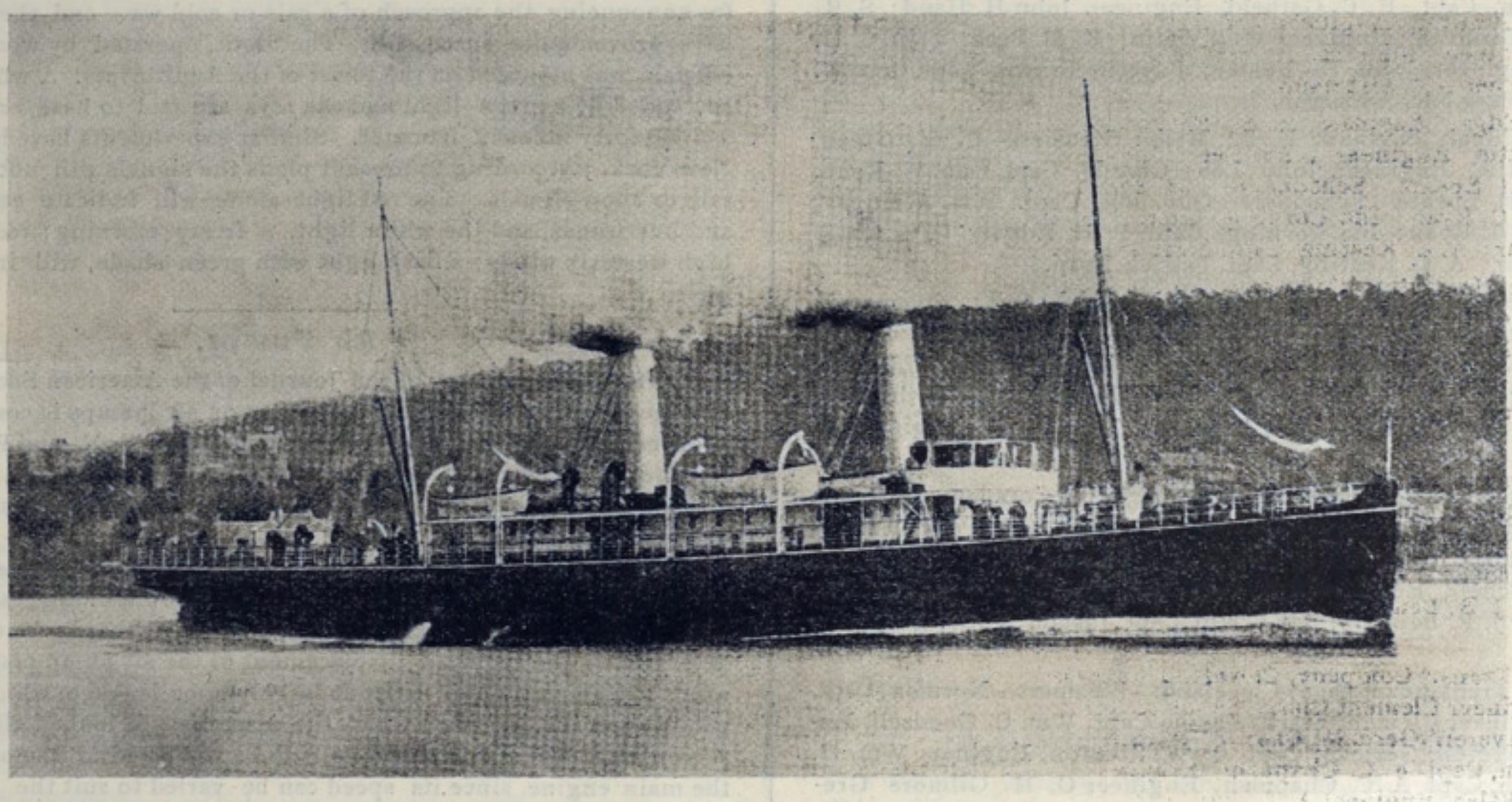
Channel Steamers to Connect with American Liners.

The St. Louis, first of the American Line ships built in this country, is booked to leave New York for Southampton on June 5, in command of Capt. William G. Randle who was formerly in the Paris and who is now at Cramp's ship yard superintending the finishing and fitting out of the vessel. In connection with the completion of the St. Louis and her sister ship St. Paul, and the transference, some time ago, of the headquarters of the American Line in England from Liverpool to Southampton, a description of the twin-screw channel steamers Columbia and Alma, built for the express mail and passenger service between Southampton and Havre, and recently put in service, will prove interesting. The Columbia and Alma are owned by and operated in connection with the London & Southwestern Railway and were built by the Messrs. Thomson, Clydebank. These vessels are described in a recent number of Engineering of London. They are among the latest of the channel steamers, and are engaged in a service that is in many ways similar to that of short-run passenger lines on the lakes. They are each 270 feet long and 34 feet beam, and the depth to the promenade deck is 23 feet, while the gross tonnage is 1,145. As the service between Southampton and Havre is performed at night, and as the run is only about six hours in duration, the dining accommodation is subsidiary to the sleeping accommodation. All of the first-class state rooms are situated almost exactly amidships, in the compartment between the two boiler rooms, the cabins being fitted up on the main, upper and promenade decks. Rooms for second-class passengers are in the after end of the vessel. There is also a dining room suited to the limited requirements in the matter of dining quarters, and a smoking room on the promenade deck.

The small illustration of one of the vessels, the Columbia, shows a fineness of form. The picture was taken when the vessel was running over 19 knots on the measured mile on the Clyde, and this speed on relatively low power is a cause for special interest in the machinery. The engines are of the four-cylinder, triple expansion, direct acting, surface condensing type, the four cylinder arrangement being adopted so that the weight of the moving parts is decreased, and consequently the vibration of the ship lessened. Bilge keels have also been fitted to prevent rolling. The four cylinders of each engine work on separate cranks, of course, which are so balanced as to obviate vibration. Diameters of the cylinders are 19 inches high pressure, 29 inches intermediate, while each of the low pressure cylinders is 33½ inches, all with a stroke of 2 feet 6 inches. The valves of the cylinders are of the piston type provided with balance cylinders, and are worked by ordinary link motion. The reversing gear is controlled by a combined steam and hydraulic engine, and the levers of the reversing shafts are fitted with screw gear to allow of the expansion in each cylinder being altered independently of the other. All the gear for controlling the engines is operated from the forward end of the engine rather than from the front, and the installation of the auxiliary machinery is such that the engineer in charge of the main engines need not leave his position to control any of the pumps, etc. The cylinders are supported at the back on cast columns, but the front columns are of forged steel, for securing both accessibility and lightness. The crank shafts are in two pieces, and, together with the thrust tunnel and propeller shafts, are of steel. The thrust blocks are cast iron, and the four collars are of cast steel. The latter are lined with white metal, and are of the horseshoe type, each separately adjustable. The screw propellers have three blades of manganese bronze fitted to bosses of cast steel.

In addition to the two sets of main engines, space has had to be provided for the following auxiliary machinery, in the engine room: One set electric light machinery; two feed pumps and heater; two duplex bilge and fire pumps; one duplex sanitary pump; and one duplex fresh water pump. Steam at 160 pounds pressure is supplied by two large-single-ended boilers with four furnaces in each, worked under forced draught on the closed stokehold system, the air being supplied by two double-breasted fans, one in each stokehold.

The guaranteed speed for the Columbia and her sistership was 18½ knots, which on a six hours' run was easily exceeded. On the measured mile a mean speed of 19.3 knots was obtained. Mean results were as follows: Revolutions—Port, 192; starboard, 191. Indicated horse power—Port, 1,830; starboard, 1,910; total, 3,740. The steam pressure was 160 pounds; vacuum 26½, and speed of vessel 19.3 knots. The number of revolutions was 191, which gives a piston speed of 955 feet per minute, obtained on considerably less than 4,000 horse power.



TWIN-SCREW PASSENGER STEAMER COLUMBIA.

To Replace the Chicora.

Ever since the loss of the steamer Chicora became a certainty, the Graham & Morton line of Chicago has been looking around for some boat to take her place during the coming summer. It is too late to build, and the line will have to depend upon a chartered steamer. It has been no easy matter to find a boat fulfilling the peculiar requirements of the service. First of all, she must be fast, for the patrons of the line have been educated to a run of four hours between Chicago and St. Joseph, a distance from pier to pier of sixty miles. In the second place, the boat must be one which does not draw over 12 feet, the limit of draft over the bar at St. Joseph. And third, the steamer must be a good sea boat, for the run across the lake is sometimes extremely trying, particularly in heavy northwest gales. So much of the freight carried during the fall is fruit that the company's steamers must cross the lake regardless of wind or weather. It has been found extremely difficult to charter a steamer fulfilling all these requirements, and notwithstanding all reports to the contrary, no arrangements have yet been closed for a charter. It is not unlikely that the City of Milwaukee would have been taken, but just before the papers were drawn up, the Grand Trunk people decided to use the steamer on the Grand Haven-Milwaukee route. Negotiations for one of the Detroit & Cleveland steamers have fallen through, as unsurmountable objections got in the way. It is not impossible that the line will be forced to go to salt water to get a boat fulfilling all the requirements of its service. Most likely a large steel boat will be built next fall and winter to take the place of the lost Chicora.

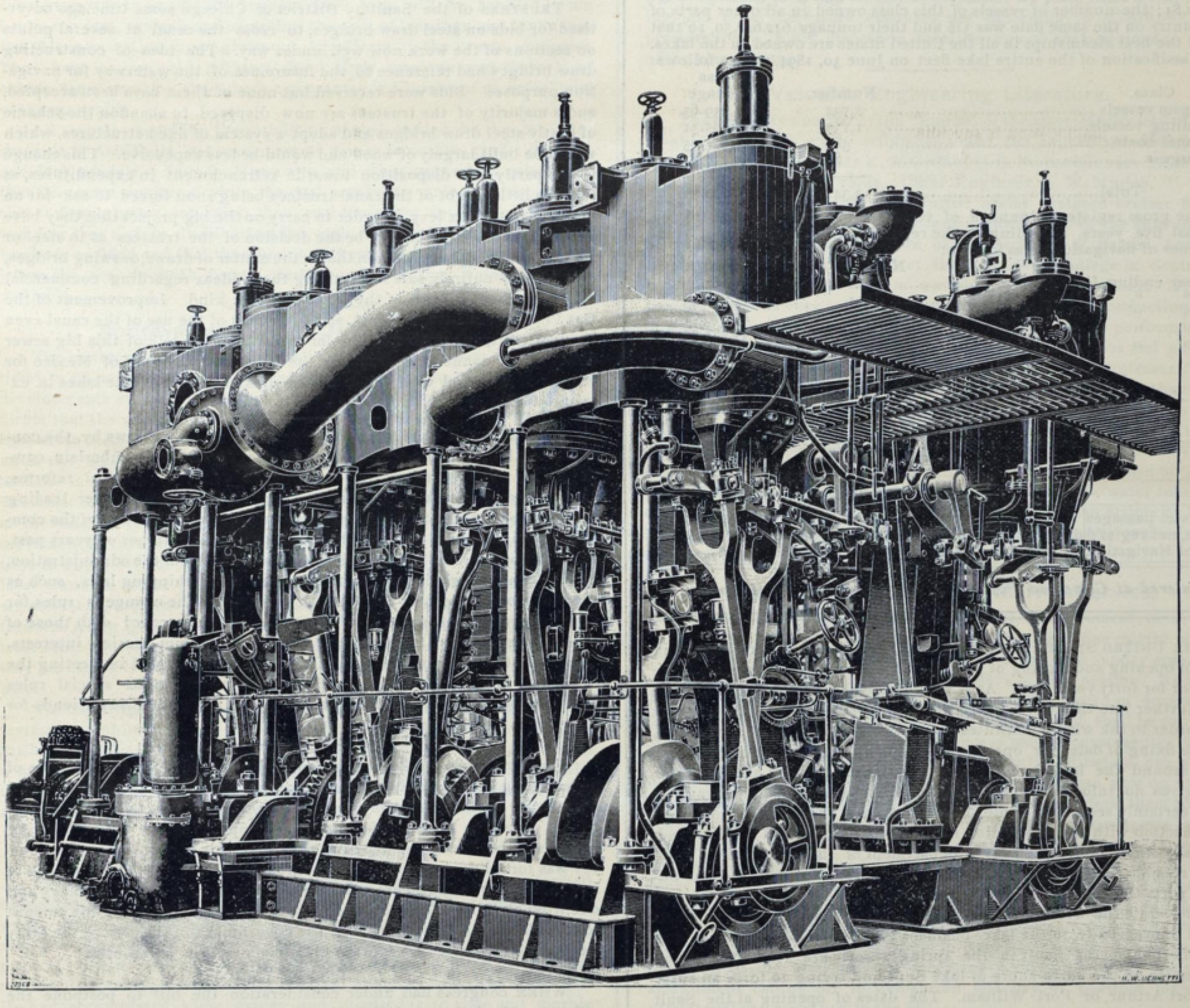
In Russia, where petroleum is very plentiful, oil is used quite extensively as fuel in manufacturing establishments, but to only a limited degree on steam vessels, where there is great danger if anything excepting the refuse of petroleum is used. It is now announced, however, that the Russian Steam Navigation Company has decided to fit all the boilers of the larger vessels of its fleet for petroleum firing in place of coal.

More Important Claims Made for Hot Draft.

George W. Dickie, manager of the Union Iron Works, San Francisco, recently made some tests on the Pacific Coast Steamship Company's steamer Pamona, before and after being fitted with the Howden system of hot draft, and is greatly pleased with the results, which are very favorable to the use of the draft apparatus. A full report of the tests is contained in the March number of Industry, the San Francisco engineering magazine. The Pamona is a vessel of 1,150 tons displacement, light, and is equipped with triple expansion engines, having cylinders of 23, 35 and 56 inches diameter and 36 inches stroke.

In order to have a basis for comparison before the vessel was fitted to receive the Howden system, a very careful test was made to determine her economical qualities, and also to prepare data for comparison. It was decided during one of her trips to make a careful test of six hour's duration. This was done under the direction of the company's engineer, and the engineer of the Union Iron Works. Previous to the change the boilers of the Pamona had a heating surface of 2,963 square feet, and a grate area of 102 square feet. With that boiler capacity the best that could be done for collective horse power was 1,078, that being the power obtained on a six hours' test, and it was acknowledged that this amount of power could not be maintained with the best Pacific coast coal throughout the twenty-four hours' trials as at the beginning of it. In fitting the Howden system the grate area was reduced from 102 sqnare feet to 80 square felt, the heating surface remaining the same. Not having had any experience with this system in connection with Pacific coast coals, it was thought advisable not to attempt to obtain the horse power per foot of grate that Mr. Howden claimed was possible. On her first trip, however, the Pamona showed that a still further reduction of grate surface would be an advantage, even if the horse power was to be maintained at a considerable increase over what was possible before. The grate surface was therefore reduced to 73 square feet.

Results of both tests are very carefully reported in technical form, and it is noted that notwithstanding such a large reduction in the grate surface, from 102 to 73 square feet, the power was readily maintained at 1,472 horse power, while previous to the change the best that could be done with 100 square feet of grate surface was 1,078 horse power. This increase of power was obtained with a marked increase of economy, the coal per horse power before conversion being 2.22, and after conversion 2.09. Mr. Dickie says that this economy has not only been maintained since the tests have been made, but has really been increased, taking the whole voyage for comparison. The trial before conversion was for six hours while the test after conversion was for sixteen hours, showing that the conditions obtained on the test after the Howden system was fitted were conditions that could be continuously maintained. It is also noted that the quality of coal used deteriorated very materially between the time the first trial was made and the trials under the Howden system.



FOUR-CYLINDER TRIPLE EXPANSION ENGINES—STEAMER COLUMBIA.

Arrangements are being made at San Francisco to fit the Howden system to the Oregon Railway and Navigation Company's steamer Columbia, and it is expected that a few more applications of the system will open a wide field for use of the poor coals of the Pacific.

The Illinois Steel Company is in the field as a competitor for business in steel plate. Preliminary tests of its new open hearth steel works and plate mill have been made. The new works are in close proximity to the rail mill at South Chicago, but there is ample ground space for enlargement and improvement. The plate plant embodies all the latest improvements in plate rolling practice. It was projected on the general plan of the Wellman mill at Thurlow, Pa. Electric appliances have been introduced with great success in saving labor.

Twenty cents a copy will be paid for two copies each of Vol. V. Nos. 3 and 9, MARINE REVIEW, if mailed in good condition to 516 Perry-Payne Bldg, Cleveland, O.

MARINE REVIEW

DEVOTED TO THE LAKE MARINE AND KINDRED INTERESTS.

Published every Thursday at No. 516 Perry-Payne building, Cleveland, O.

SUBSCRIPTION—$2.00 per year in advance. Single copies 10 cents each. Convenient binders sent, post paid, 75 cents. Advertising rates on application.

The books of the United States treasury department contain the names of 3,341 vessels, of 1,227,400.72 gross tons register in the lake trade. The number of steam vessels of 1,000 gross tons and over that amount on the lakes on June 30, 1894, was 359 and their aggregate gross tonnage 634,467.84; the number of vessels of this class owned in all other parts of the country on the same date was 316 and their tonnage 642,642.50, so that half of the best steamships in all the United States are owned on the lakes. The classification of the entire lake fleet on June 30, 1894, was as follows:

Class.	Number.	Gross Tonnage.
Steam vessels	1,731	843,239.65
Sailing vessels	1,139	302,985.31
Canal boats	386	41,961.25
Barges	85	39,214.51
Total	3,341	1,227,400.72

The gross registered tonnage of vessels built on the lakes during the past five years, according to the reports of the United States commissioner of navigation, is as follows:

	Number.	Net Tonnage.
Year ending June 30, 1890	218	108,515.00
" " " 1891	204	111,856.45
" " " 1892	169	45,168.98
" " " 1893	175	99,271.24
" " " 1894	106	41,984.61
Total	872	406,976.28

ST. MARY'S FALLS AND SUEZ CANAL TRAFFIC.

	St. Mary's Falls Canal.			Suez Canal.		
	1893.	1892.	1891.	1893.	1892.	1891.
No. vessel passages	12,008	12,580	10,191	3,341	3,559	4,207
Ton'ge, net regist'd	9,849,754	10,647,203	8,400,685	7,659,068	7,712,028	8,698,777
Days of Navigation	219	223	225	365	365	365

Entered at Cleveland Post Office as Second-class Mail Matter.

THE UNITED STATES weather bureau has issued a circular giving dates of opening and closing of ports and duration of navigation on Lake Superior for forty years past. As it is understood that the bureau intends to go further into this work, extending it to ports on other lakes, it may be in order to ask what constitutes the opening or closing of navigation, and the fixing of dates for opening and closing at any of the numerous ports around the lakes? This first circular relative to Lake Superior ports gives no information on this feature of the subject, although it would certainly seem that a rule should apply and should be made known in connection with the publication of a vast amount of data of this kind, especially when undertaken by a department of the government from which reliable statistics are expected. In the report covering Lake Superior ports the average date of opening at Port Arthur is put down as April 26, while the average at the Sault canal is May 1. Now it is well known to everybody in the lake business that long after a passage has been effected at the Sault in the spring vessels are very often found bucking ice on the north shore of lake Superior, trying to force an entry into Port Arthur or Fort William. The dates of opening at the Sault canal are of course reliable, as there is no question regarding the time of opening or closing the lock, but as Port Arthur is reported to have been open to navigation on dates that show an average earlier than that of the Sault, the absence of an explanation of the kind referred to, may cast discredit on the entire work. If the date of the arrival or departure of a vessel, even in local trade, establishes the opening, then it may be possible that the average of dates of opening at Port Arthur is correct. The yearly reports in the circular show only three years (1878, 1882 and 1893) in the past twenty-three years, when the opening at Port Arthur was later than at the Sault. If this record is correct it is certainly surprising. The establishment of a rule by which satisfactory comparisons may be made as to dates of opening or closing of navigation at points other than the St. Mary's Falls canal, the Straits of Mackinac and other canals, is a difficult problem. Navigation is rightfully said to be open on the lakes when the first vessel passes the Straits of Mackinac, which is invariably the signal for a general movement of vessels, that are not confined to local traffic. The opening of the Sault canal to Lake Superior and the Welland to Lake Ontario usually follows a little later, but even the vessels that are chartered for Lake Superior business make a trip or two from Lake Michigan before beginning their regular Lake Superior service, and the Straits of Mackinac is accordingly considered the objective point in considering this subject. It would seem that error and confusion will result from connecting dates established by local traffic with those having reference to the general movement of vessels begun or ended at such important points as the Straits of Mackinac or the canals. At Cleveland and other Lake Erie ports, for instance, the traffic in the stone trade to the islands and the movement of passenger boats engaged on short runs is often begun early in March and extended late into December. On Lake Michigan there is a winter service between some ports, and short trips are made by lumber carriers and the smaller class of vessels long before it is possible to move the business fleet of the lakes.

TRUSTEES of the Sanitary District of Chicago some time ago advertised for bids on steel draw bridges, to cross the canal at several points on sections of the work now well under way. The idea of constructing draw bridges had reference to the future use of the waterway for navigation purposes. Bids were received but none of them have been accepted, and a majority of the trustees are now disposed to abandon the scheme of costly steel draw bridges and adopt a system of fixed structures, which would be built largely of wood and would be less expensive. This change is due partly to a disposition towards retrenchment in expenditures, as there is little doubt of the canal trustees being soon forced to ask for an increase in the tax levy, in order to carry on the big project that they have undertaken. Whatever may be the decision of the trustees as to steel or wooden bridges, it would seem that in the matter of draws, or swing bridges, they will be entirely safe in limiting their ideas regarding commercial use of the canal to craft of the ordinary canal kind. Improvement of the Des Plaines and Illinois rivers, so as to admit of the use of the canal even by river craft, is a matter of the far future, and the talk of this big sewer opening up connection between the lakes and the Gulf of Mexico for vessels of the kind that make up the business fleet of the lakes is extremely visionary.

A SUMMARY of changes made in general shipping laws by the congress that has just adjourned will show that Mr. E. T. Chamberlain, commissioner of navigation, has accomplished more practical reforms, through earnest work with Senator Frye, Mr. Fithian and other leading members of congressional committees on shipping, than any of the commissioners who have preceded him during a great number of years past. Mr. Chamberlain has had the advantage of favor from the administration, but the changes which he has brought about in shipping laws, such as the abolition of registry and license bonds and the change in rules for the measurement of vessels, bringing our laws into accord with those of other governments, have all met with support from marine interests. The earnest manner in which Mr. Chamberlain succeeded in meeting the desires of lake vessel owners and masters regarding the special rules that have been established for lake navigation has made many friends for him in this part of the country.

TWENTY thousand dollars is now to be expended for the purpose of ascertaining the feasibility, permanance and cost of the construction and completion of the Nicarauga canal by the route so long talked of in congress. Upon the house refusing to take up the senate bill authorizing issuance of bonds for constructing the canal, this appropriation for a survey was forced during the closing hours of the session. The survey is to be made by three engineers, one from the army, one from the navy and one from civil life. The engineers are to be paid $5,000 each, this amount to include regular salaries paid by the government in the case of the army and navy engineers. A report is to be made within six months.

WHEN congress had under consideration the bill to postpone the enforcement of the regulations for preventing collisions at sea, Mr. Geo. W. Fithian, chairman of the committee on merchant marine and fisheries, and leader of the free ship advocates, found an opportunity to secure publication in the Record of a large collection of opinions adverse to the law prohibiting American registry for ships purchased abroad. The speech takes up twelve pages of the Record and is published in the issue of Friday, March 1.

REPRESENTATIVES of Ogdensburg shipping interests interviewed several of the Canadian ministers at Ottawa a few days ago, with a view to securing a reduction in canal tolls on west bound freight. The opinion now prevailing at the dominion capital is that no tolls will be charged to vessels passing in the Canadian canal at Sault Ste. Marie, which will be opened for navigation some time during the coming season.

Three torpedo vessels being built by the Fairfield Ship Building and Engineering Company for the British Government are being fitted with Babcock & Wilcox boilers.

Rapid Handling of Coal.

Negotiations now being carried on between railway and dock companies and the manufacturers of car dumping machines would indicate that the close of the coming season will find car dumping machines in use on all of the leading coal shipping docks at Lake Erie ports. The result will be the sale and removal of the bucket handling machinery now at Lake Erie ports to upper-lake receiving docks, and an increase of dispatch in methods of handling coal almost equal to that recently attained in the ore business. The McMyler car dumping machine is not now the only appliance of its kind offered to dock owners, but it is, of course, the only one that has been given a trial in actual service and found to do all that was expected. The Brown Hoisting & Conveying Machine Company is said to have secured four or five orders for machines of the kind previously referred to in these columns, on guarantees that with a side dumping plant putting the coal into five-ton buckets, and with two hoisting and conveying rigs to handle the buckets, 3,000 tons will be handled in ten hours at a cost, exclusive of trimming charges, of less than one cent a ton. But this information is not given out by officers of the Brown company. They have as yet said nothing about their machine, and there is, of course, some question about such a guarantee in advance of an actual trial of the apparatus.

All reports regarding the condition of coal loaded by the McMyler machine at Ashtabula last season are of a very favorable kind. Railway and dock officials at Duluth, Marquette and other upper lake points say that they were convinced while the coal was being unloaded last season that it was in better condition than coal loaded by the bucket method, and now they find, in distributing the coal from dock, that this opinion has been verified and that the amount of breakage after further handling leaves the coal in much better condition finally than it was under old methods.

Improvement in the Outlook for Ore.

The matter of prices to govern sales of iron ore for next season's delivery is no nearer a settlement than it has been for some time past, but developments of the past week or ten days in the iron market would indicate that the producers of Bessemer ores other than Messabi, who have agreed to demand a moderate increase over last year's prices, and not enter the market with a view to making sales until furnacemen are actually in need of new ore, will gain their point. The situation as far as Bessemer ores are concerned is improved. Heavy consumption has caused an increase of orders for shipments from Lake Erie docks, so that the movement to furnaces at present is probably greater than it was at this time in either 1893 or 1894. That this consumption will continue, barring labor troubles, seems quite certain, as purchases of pig iron made of late are sufficient, with the ordinary demand, to keep in active operation all furnaces using Lake Superior ores. This improvement is cause for at least some encouragement among vessel owners, although several weeks may yet elapse before inquiry develops for the chartering of boats at any price.

The meetings of coal producers of Ohio and Pennsylvania, who are trying to combine interests and overcome abuses in the trade that have made it profitless, have not yet developed anything that is liable to have a special bearing on freights. The strike of coal miners in Pennsylvania, inaugurated earlier than usual this year, will, it is hoped, be settled before the lake shipping season begins.

Death of T. H. Walsh.

Friends of T. H. Walsh in Cleveland and Detroit have been informed of his death, which occurred at Chilhowee, Tenn., on Wednesday of last week. For a great number of years previous to 1893, Mr. Walsh was associated with Thomas Adams of Detroit in the ownership and management of vessels. During the late prosperous period of a few years in the ore business, he represented the Farwell & Adams interests in Cleveland. He had accumulated some money and invested it in slate and marble lands of Tennessee. Two years ago he went south to look after these interests. He was depressed in spirits from illness following a severe attack of grip, contracted before leaving Cleveland, and his investment was not readily profitable. He leaves a wife and two children. Mr. Walsh was associated with R. J. Hackett and others of Detroit in the days when the lumber business of the Saginaw valley was profitable and was well known in Detroit, Cleveland, Sandusky and other lake cities. He was a man of literary attainments and was possessed of a most affable disposition.

Survey for an Outlet to the Seaboard.

Another clause in the civil sundry appropriation bill in which lake vessel owners are specially interested, and which was worked into the bill just before the adjournment of congress, appropriates $10,000 for investigation of the subject of a deep-water outlet from the lakes to the Atlantic seaboard. This amendment is the result of efforts made by the representatives of lake shipping interests who attended the Toronto waterways convention, a few months ago. The president is authorized to appoint three persons, who shall have power to meet and confer with any similar committee which may be appointed by the government of Great Britain or of the Dominion of Canada, and who shall make inquiry and report whether it is feasible to build such canals as shall enable vessels engaged in ocean commerce to pass to and fro between the great lakes and the Atlantic ocean, with an adequate and controllable supply of water for continual use; where such canals can be most conveniently located, the probable cost of the same, with estimates in detail; and if any part of the same should be built in the territory of Canada, what regulations or treaty arrangements will be necessary between the United States and Great Britain to preserve the free use of such canal to the people of this country at all times; and all necessary facts and considerations relating to the construction and future use of deep-water channels between the great lakes and the Atlantic ocean. The persons so appointed shall serve without compensation in any form, but they shall be paid their actual traveling and other necessary expenses, not exceeding in all $10,000. The president may, in his discretion, detail as one of such persons an officer of the army or navy.

Valuable Engineering Literature.

The February number of the "Journal of theAmerican Society of Naval Engineers," which is now published under the immediate direction of Passed Assistant Engineer R. S. Griffin, U. S. N., contains several articles and reports of special value. Chief Engineer A. W. Morley, U. S. N., reports the contract trial of the United States armored cruiser Maine, and the report is accompanied by several engravings of the ship and her machinery. In the continuation of the lectures of Passed Assistant Engineer McFarland, delivered at the Naval War College in September last, trial trips are dealt with in a most interesting manner. Mr. McFarland explains very fully the United States system of conducting trials of war vessels, refers to comparisons drawn between the performance of war vessels and the fast steamers in the merchant service and explains the standardized screw method of conducting trials. Professor Ira N. Hollis of Harvard University gives the journal the benefit of the results of four tests of Belleville tubulous boilers in use on the Boston yacht Wild Duck. These tests were made in November last for the Atlantic Works of East Boston, and the results include data bearing upon advanced features of the discussion attending the much-discussed subject of Scotch and tubulous boilers. Another valuable contribution on water tube boilers is a translation by W. F. Worthington, U. S. N. of an article by Nabor Soliani, the eminent Italian naval authority who has many warm friends and admirers among United States naval officers.

Pensions in the Revenue Marine Service.

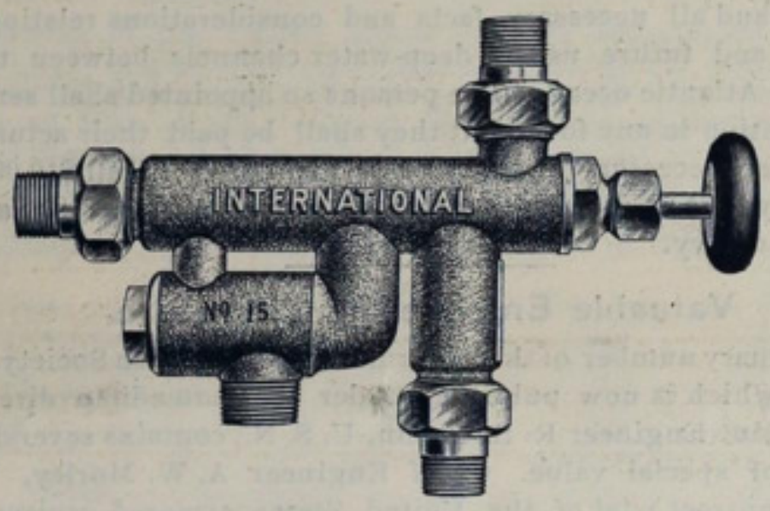
Congress has finally established a system of retirement, or in other words a pension system, for certain officers of the revenue marine service. It was done through a provision worked into the civil sundry appropriation bill in the senate during the closing days of the session. As finally agreed upon in conference, the act provides that a board of surgeons of the marine hospital service, appointed by the president, shall be convened from time to time, to pass upon such officers as may be permanently incapacitated for service, and they shall be permanently retired on one half of service pay. This rule will apply also to officers who are now on waiting orders with full pay on account of disability that renders them actually unable to perform service of any kind, and pension in all respects is to be confined to the present force. The secretary of the treasury is to supply the places of officers retired. The measure was vigorously fought in the house, as it has been many times in the past, a large number of representatives holding that it was the entering wedge to pensions in all branches of the civil service of the government, but senators in charge of the civil sundry bill took a determined stand in favor of it, and the house was confronted with the alternative of accepting a compromise on the senate amendment calling for retirement on full pay, or possibly losing all appropriations contained in the bill.

Mr. Francis Line, Cleveland agent of the Keasby & Mattison Company, Ambler, Pa., has just closed a contract for covering with magnesia sectional covering eight boilers in the Gilchrist fleet, laid up at Buffalo. The prospect of close margins in freight for the coming season has led owners to consider economical suggestions as they have never done before, and boiler covering has passed the experimental stage in this line. The steamers J. B. Lyon, City of Naples, City of Genoa and A. P. Wright are included in this contract.

The navy department is about to begin the distribution of the first volumes of the "Official Records of the Union and Confederate Navies in the War of the Rebellion," which it is now publishing under authority of the act of congress approved July 31, 1894. The distribution of this publication rests almost entirely in the hands of members of congress, each senator having twenty-four and each representative nineteen sets at his disposal. There is a big demand for the books.

A New Injector.

There is illustrated herewith a new injector for which the makers claim most remarkable and wonderful results. It is called the International, and one claim of merit for it is that the current of water to the boiler is established against atmospheric pressure instead of against direct boiler pressure as heretofore. This is accomplished by the combination of the overflow valve K and pressure valve L. When the injector starts, the steam passing through the steam jet F and suction jet G passes down through the overflow chamber, forcing the valves K and L away from their seats and opening the passageway through the overflow for the escape of steam, which by its pressure against the valve H holds



both valves away from their seats. A vacuum being created between the jets F and G, the water is lifted, and passing through the suction jet G and combining and delivery jet H on its way to the boiler, passes down through the secondary overflow, and out through the passageways between the pressure valve L and pressure valve collar M. As the pressure increases in the delivery chamber around the delivery jet H, the valve L is gradually forced to its seat against the collar M, but does not finally close until the current to the boiler is firmly established. The valve K in the meantime is closed by the vacuum in the overflow chamber. By a new construction of the parts in the steam chamber, the same valve handle A opens the valve admitting steam to the injector, and at the same time regulates the amount of water supply, therefore no valve is required in the suction pipe, nor is one necessary in the steam pipe, except as a convenience should it be desired to remove the injector at any time while carrying steam on the boiler.

Another new feature is the fact that the combination and delivery jet H has no spill holes, and will therefore outwear three of any other make. The makers claim for this injector that it will start at 13 to 15 pounds steam pressure and work from that point up to 250 pounds pressure, giving it a range 100 pounds greater than any other automatic injector. It is automatic and restarting at any and all pressures. It lifts the water vertically 20 to 22 feet, and handles a hot water supply of 135 degrees at 65 to 80 pounds of steam; 125 degrees at 125 pounds steam. By delivering the minimum capacity it will put water into the boiler at 200 degrees at 80 pounds steam, and 260 degreee at 150 to 200 pounds of steam, the water being taken from a 4-foot lift at 74 degrees. One of the most remarkable features about this injector is its grading capacity. The best injectors heretofore manufactured have a grading capacity of only 40 to 50 per cent., while the minimum capacity of the International is 66⅔ per cent. less than the maximum capacity of the same size. The parts are made interchangeable, and are all easily accessible for cleaning, und the injector is fully guaranteed. It is manufactured by the World Specialty Company of Detroit, Mich. Descriptive circulars and price list will be sent on application.

Trade Notes.

A wooden tug 90 feet long is being built by Messrs. Hill of Fish Creek, Wis.

The Buffalo Forge Company will equip the steamer S. S. Curry with their system of blowers producing forced draft.

F. W. Wheeler & Co. of West Bay City, Mich., will build for Henry Corgan of Eagle Harbor, Mich., a wooden tug of 60 feet keel, 16 feet beam and 8 feet hold.

A new boiler of the Scotch type, 12 by 14 feet, has been fitted to the Anchor Line steamer Delaware by the Lake Erie Boiler Works of Buffalo. The Trout works of the same place is replacing the high pressure engines of the steamer Birckhead with a fore-and-aft compound.

The Lawley Company of Boston recently secured an order for a steam yacht of 100 feet load water line, and to develop a speed of 14 knots. The owner is as yet unknown but is thought to be Dr. W. D. Hopkins of Philadelphia, who formerly owned the Gloriana and Cinderella.

Kelly, Spear & Co., builders of Bath, Me., have closed a contract to build four barges, 175 feet long and of about 900 tons each. The firm for which the boats are to be built have contracted with other builders for five more hulls, and the Bath Iron Works will construct machinery for the nine boats.

A company to be known as the Racine Yacht and Boat Works has been organized at Racine, Wis., to build boats of all kinds, especially row boats, gas and electric launches and steam and sail yachts. The concern is already prepared to make estimates and submit designs for anything in the boat line. Fred W. Martin is associated with the company as designer. He designed the sail yacht Valient, which was built for Mr. Berriman of Chicago, and also superintended her construction. The company will shortly have prepared a valuable catalogue, and Geo. D. Fellows, one of the officers, announces that a copy of it may be had by sending 10 cents to his address, to cover cost of mailing.

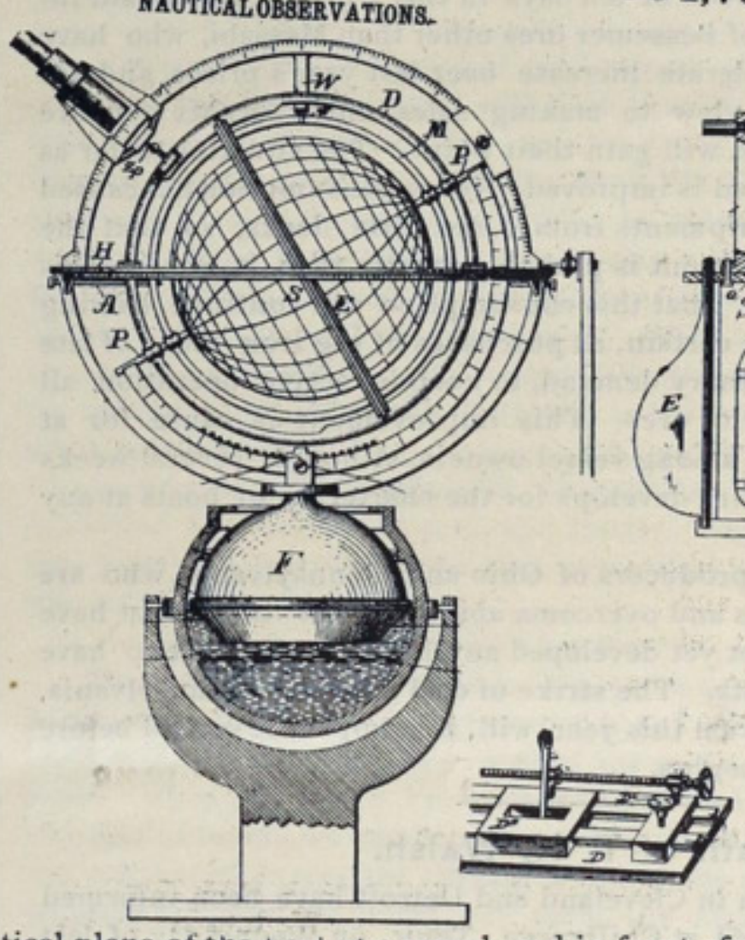
Illustrated Patent Record.

SELECTED ABSTRACTS OF SPECIFICATIONS OF A MARINE NATURE—FROM LATEST PATENT OFFICE REPORTS.

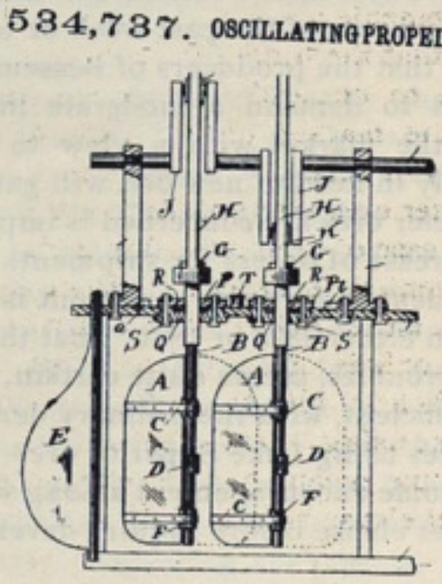
11,475. **Instrument for Taking Nautical Observations.** William H. Beehler, U. S. Navy, assignor to the Beehler Solarometer Company, Baltimore, Md, Filed Nov. 15, 1894. Serial No. 528,932. Original No. 464,261, dated Dec. 1, 1891.

Claim.—First, an apparatus for taking nautical observations comprising a bowl suspended upon gimbals and containing mercury, a float adapted to rest in the mercury in said bowl, a polar bracket supported by and adjustable from said float, horizon and meridian circles, and an azimuth ring, arranged concentric with each other, a mirror, a sliding carriage adjustable upon the azimuth ring, a telescope mounted upon said carriage, and an observing tube mounted upon the same carriage and with such relation to the telescope as to cause the lines of the axes of the telescope and observing tube to meet the surface of the mirror at equal angles. Second, the graduated rings and circles, and a horizontal ring supported upon a float so as to form a constant level base, in combination with the hinged index hand attached to a vertical support in the ver-

11,475. INSTRUMENT FOR TAKING NAUTICAL OBSERVATIONS.



534,737. OSCILLATING PROPELLER.



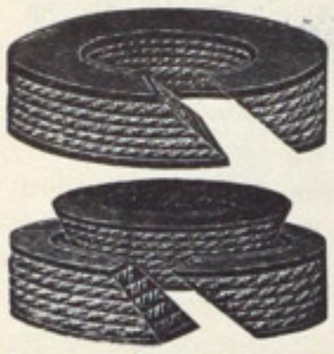
tical plane of the keel of a vessel, and in front of said apparatus, whereby the bearing of the ship's head may be indicated by the graduations upon the horizon ring of the apparatus at the instant of any observation.

534,737. **Oscillating Propeller.** John J. Brandt, San Francisco, Cal. Filed March 27, 1894. Serial No. 505,295.

Claim.—A propelling apparatus for vessels consisting of one or more oscillating arms having a blade revolubly secured to the immersed portion thereof, a secondary arm revolubly secured to the upper extremity of said main arm, in combination with a horizontal shaft bearing one or more crank arms directly connected with a longitudinal slot in said secondary arm, and means for revolving said primary arm independent of said secondary arm.

C. H. Jenking, a subscriber who is in the employ of the Canadian Pacific Railway at Windsor, Ont., says in renewing his subscription: "Enclosed please find $2. Send on the triple expansion, compound steamer MARINE REVIEW for 1895."

U. S. ENGINEER OFFICE, 157 Ottawa St., Grand Rapids, Mich. March 5, 1895. Sealed proposals will be received here until 12 o'clock noon, April 4, 1895, and then publicly opened, for Breakwater construction at Petoskey, Mich., and for Pier extensions at Frankfort Harbor, Mich. Specifications furnished on application to G. J. LYDECKER, Lt. Col., Engrs. april 1



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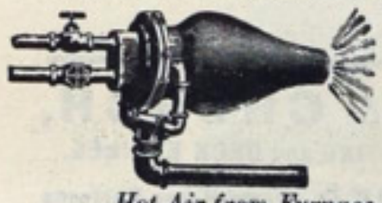

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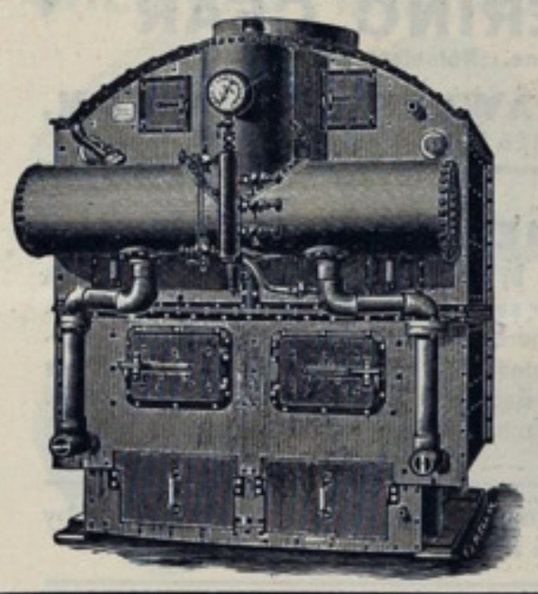

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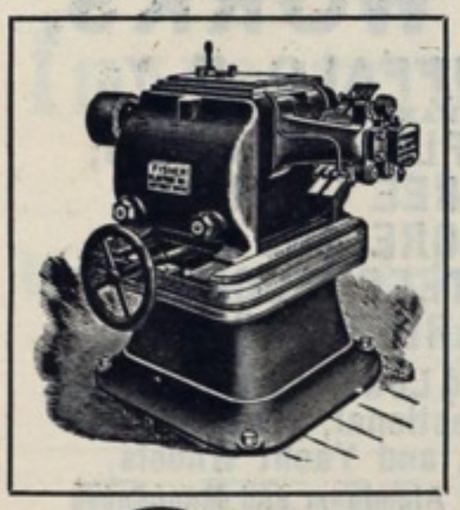

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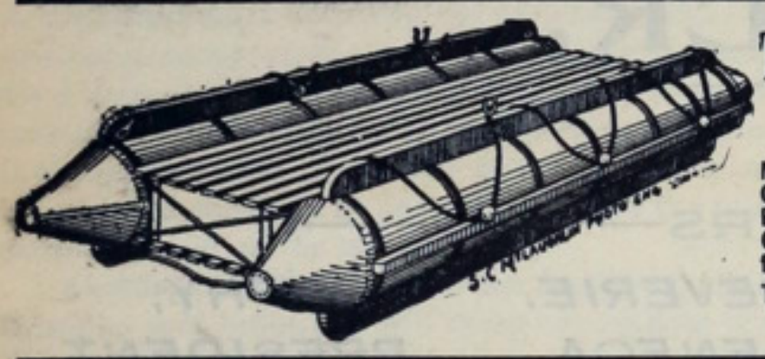

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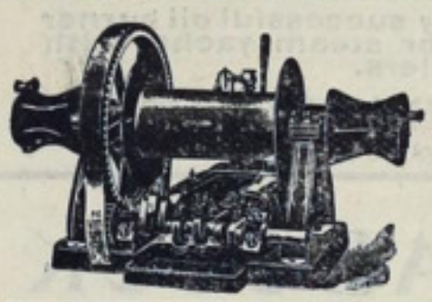

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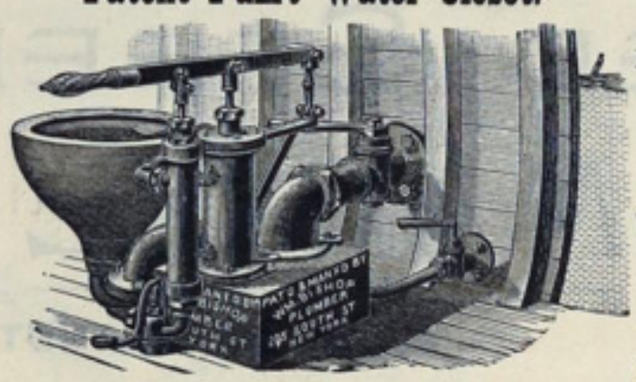

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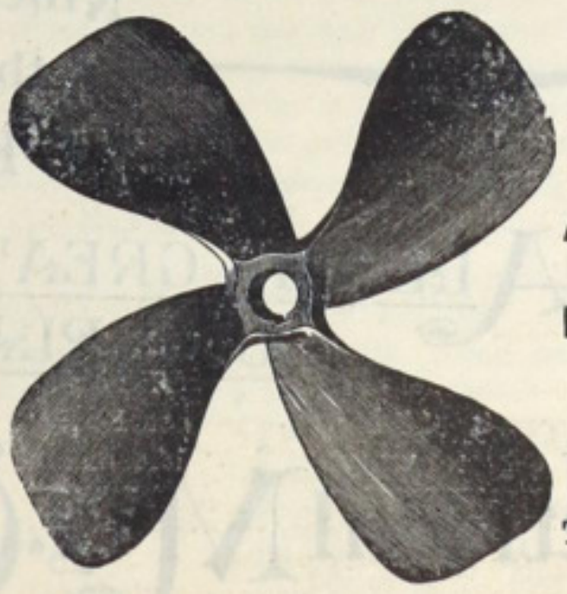

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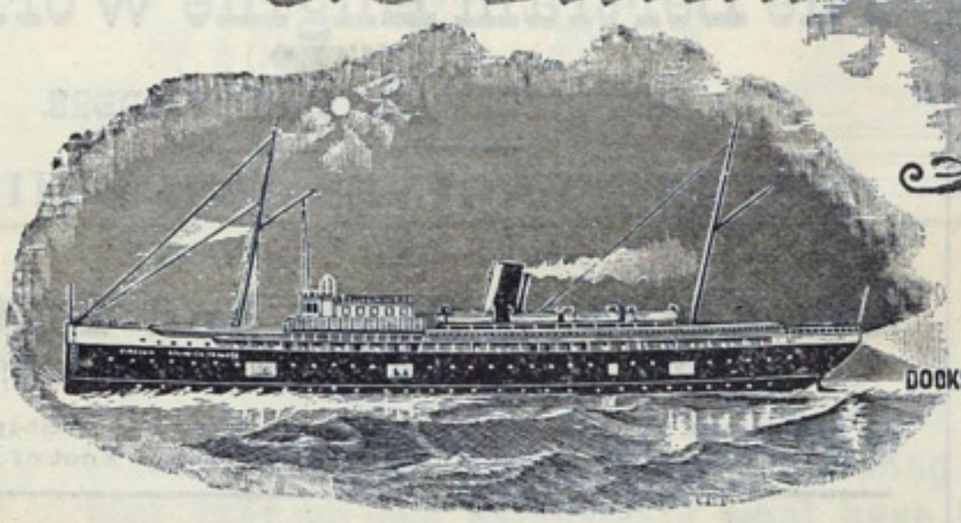

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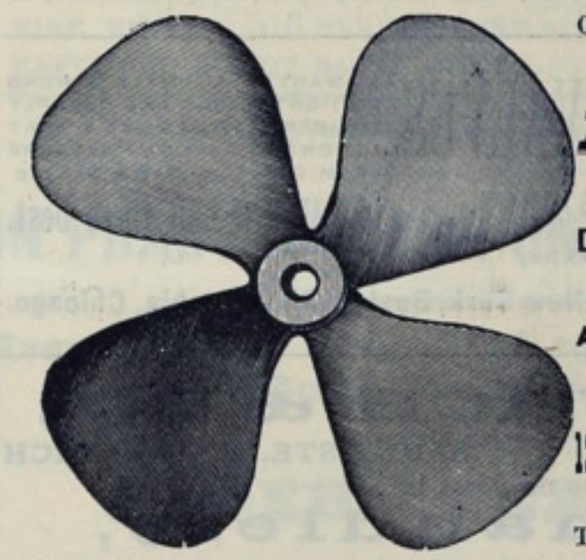

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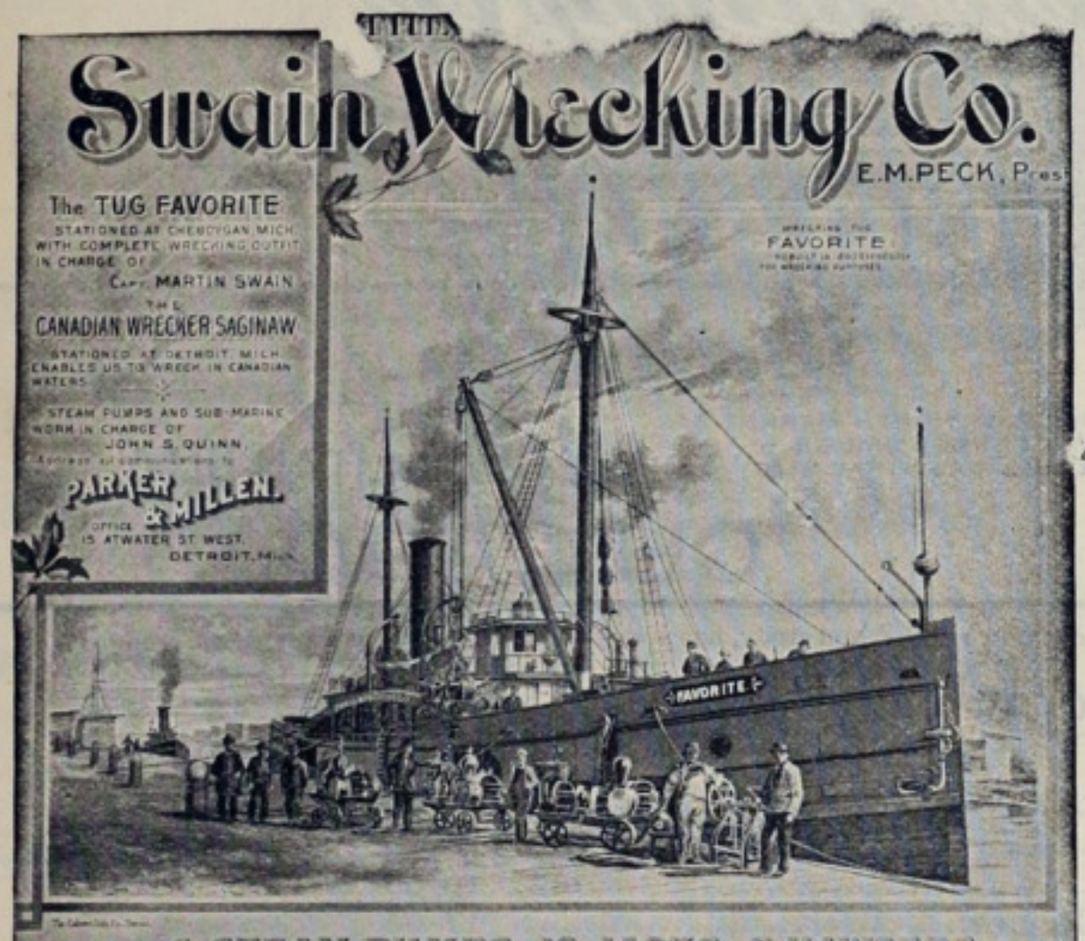

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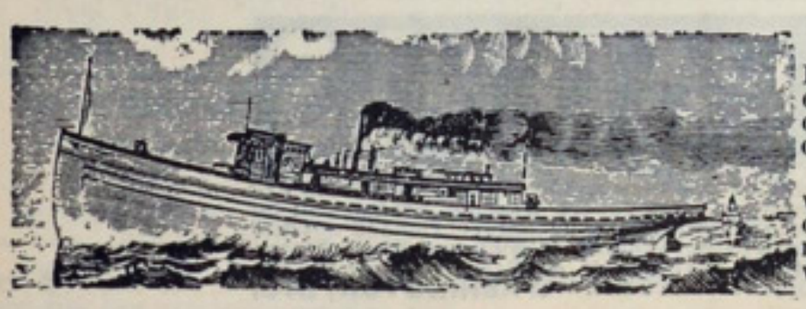

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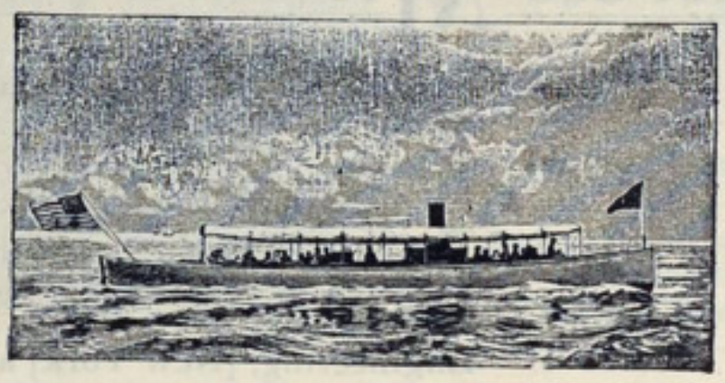

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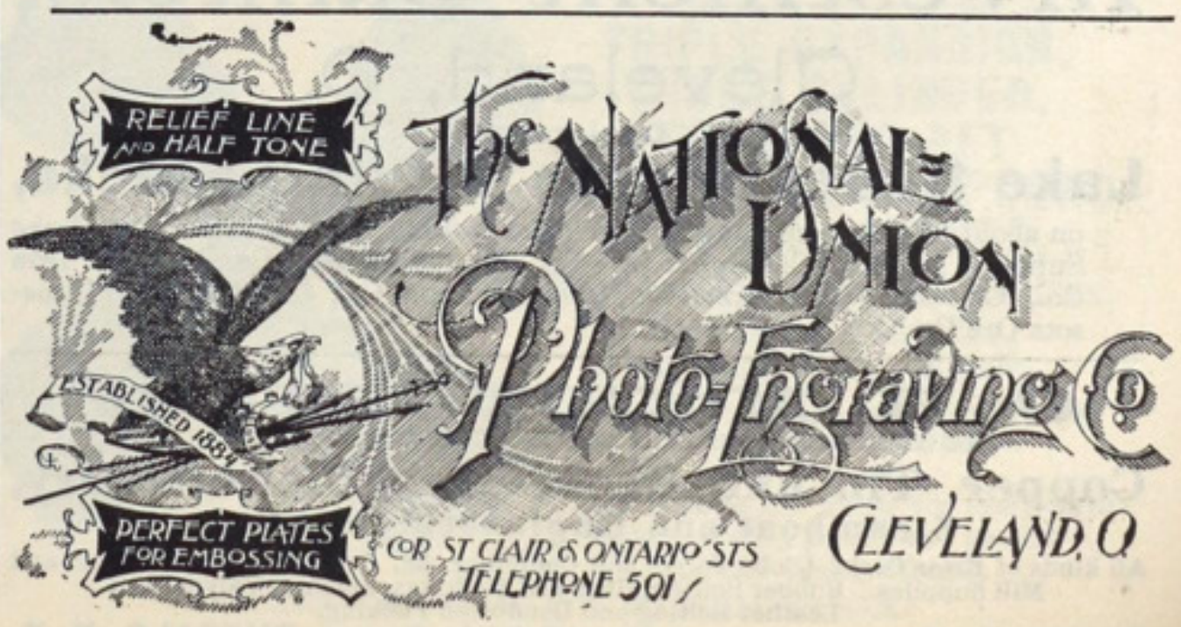

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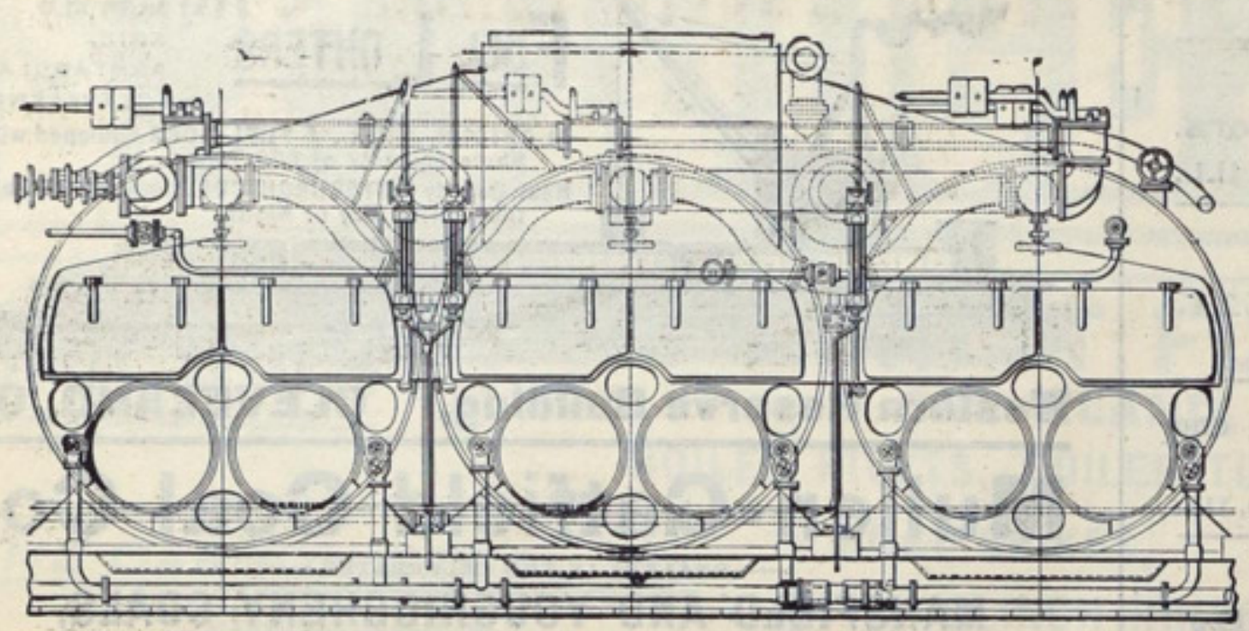

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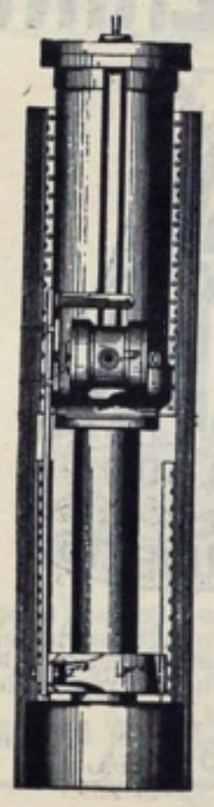

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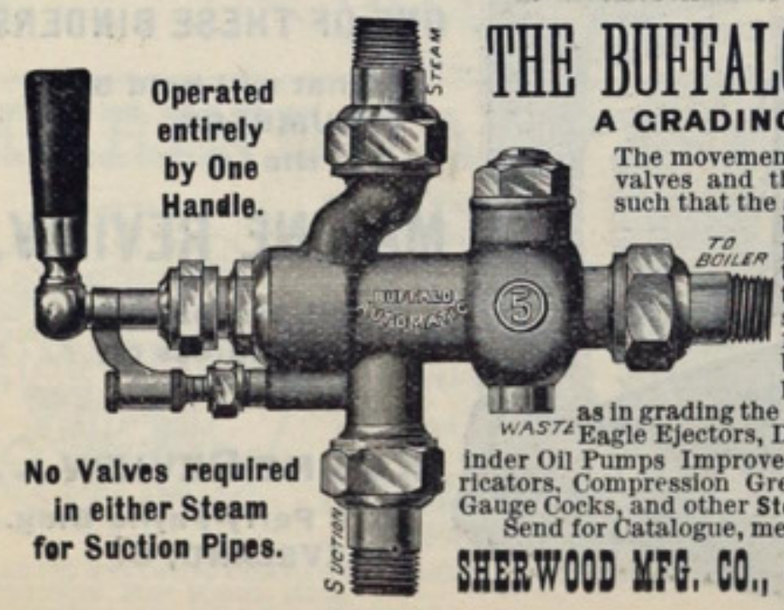

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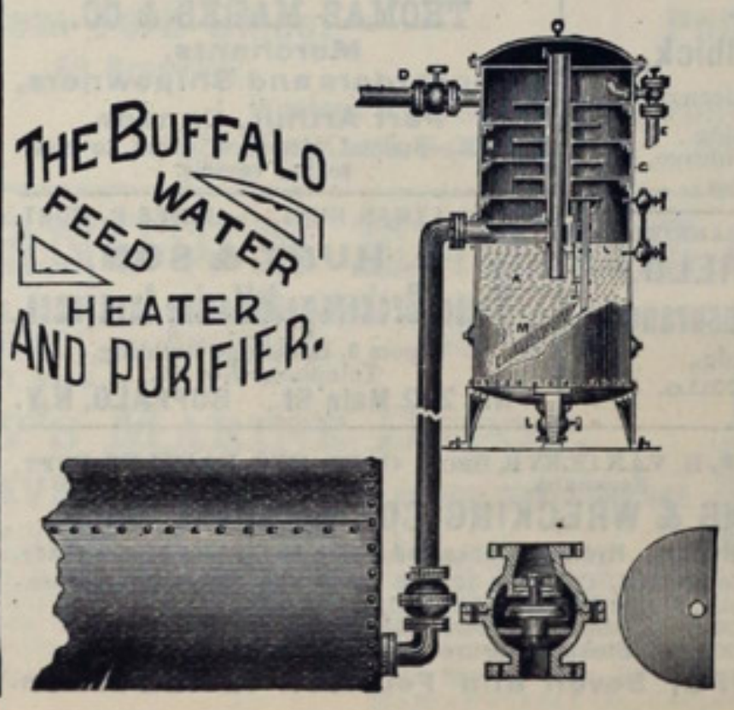

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A.—Settling chamber.
B.—Boiler.
C.—Feed pipe to boiler.
D.—Steam pipe.
E.—Water supply pipe.
F.—Check valve.
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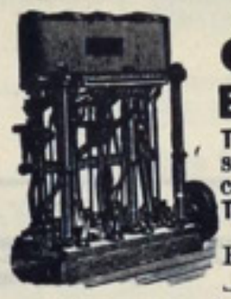
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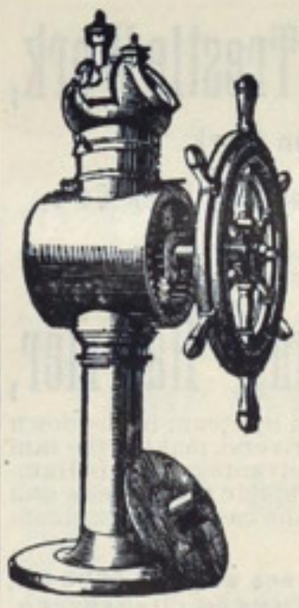
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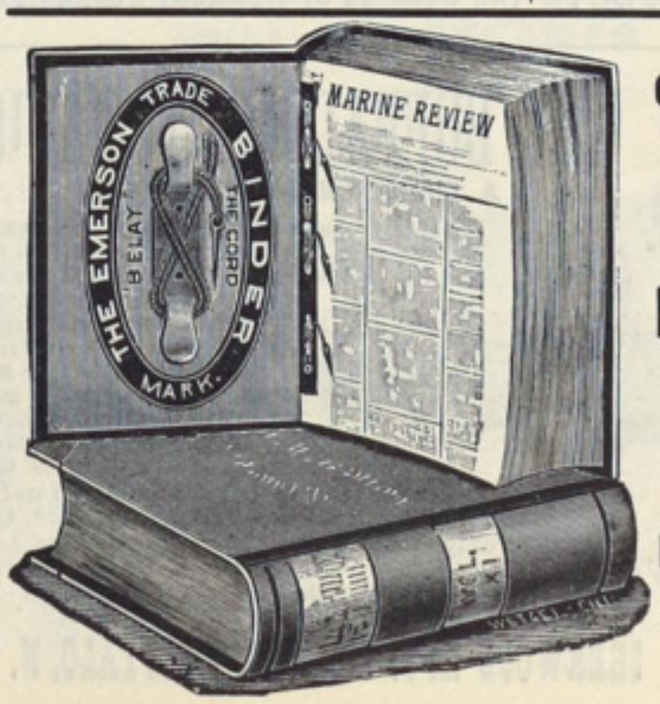

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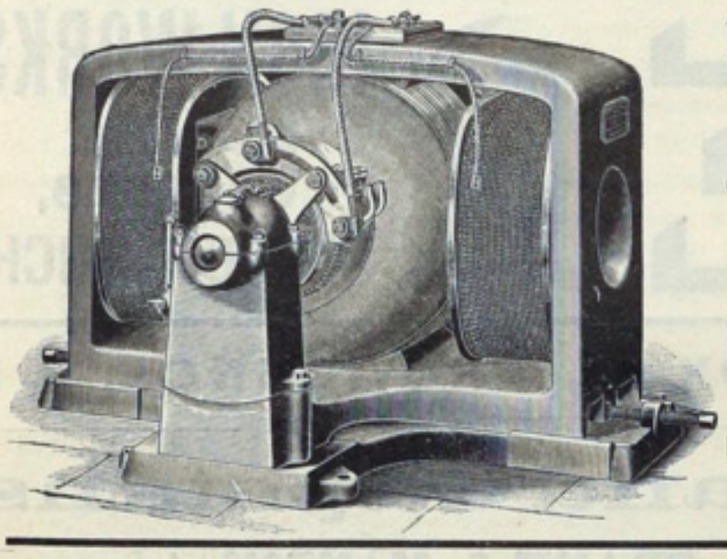

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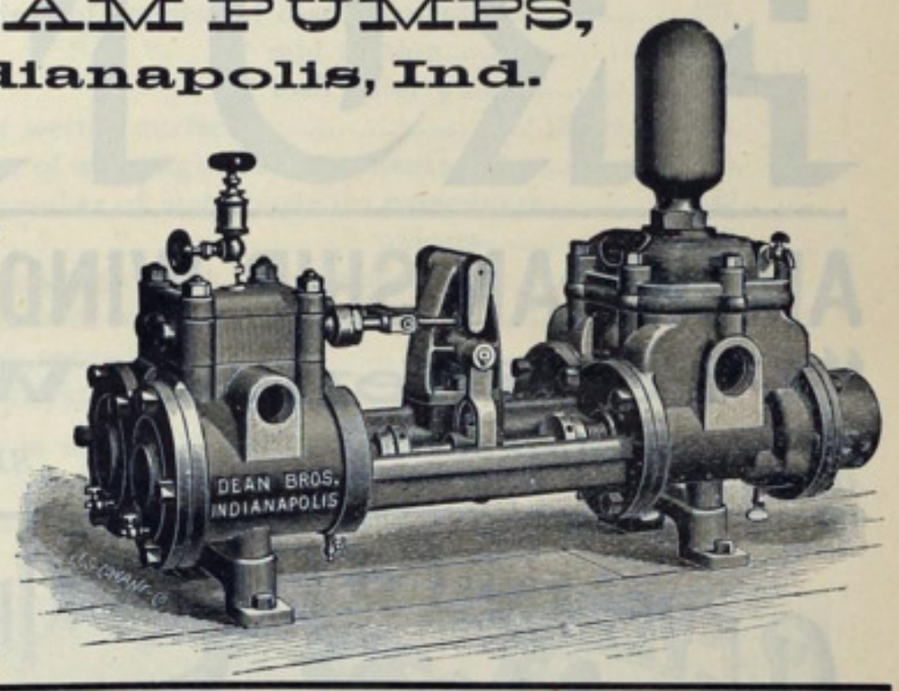

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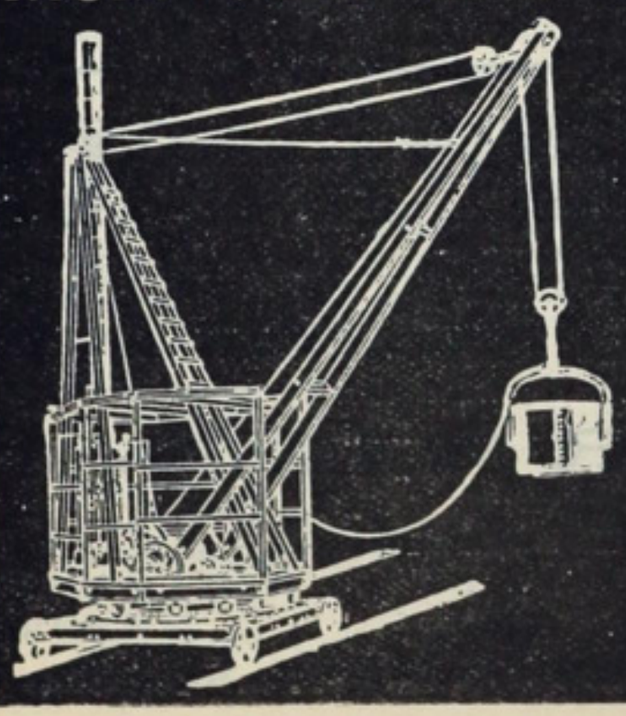

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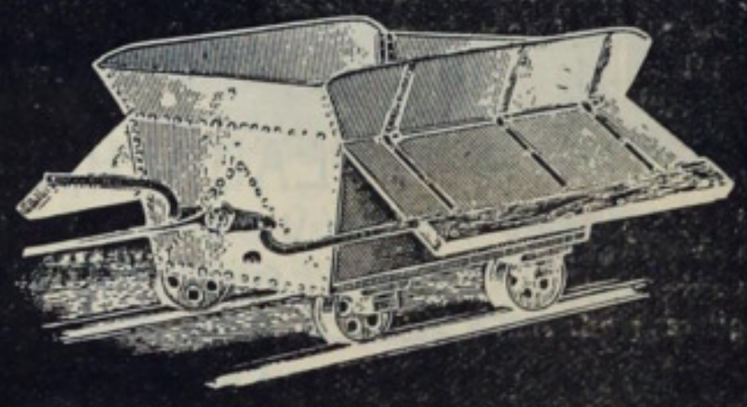

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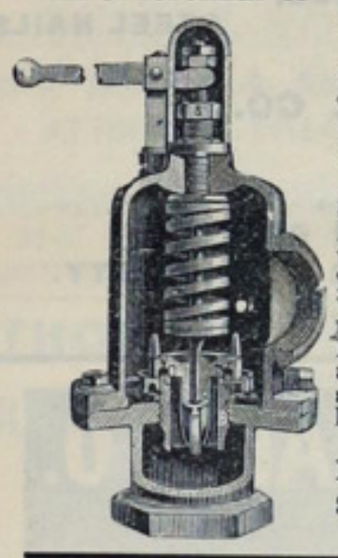

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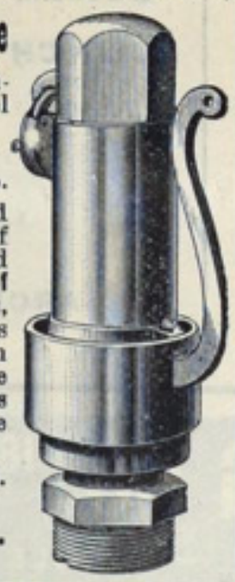

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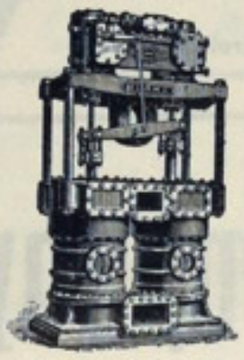

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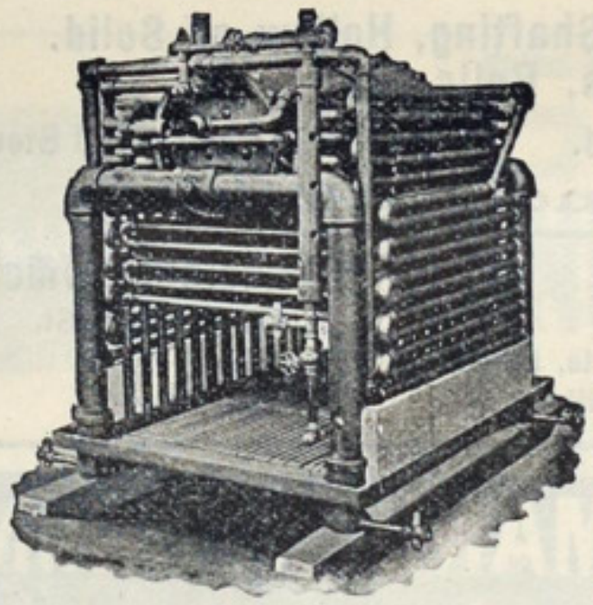

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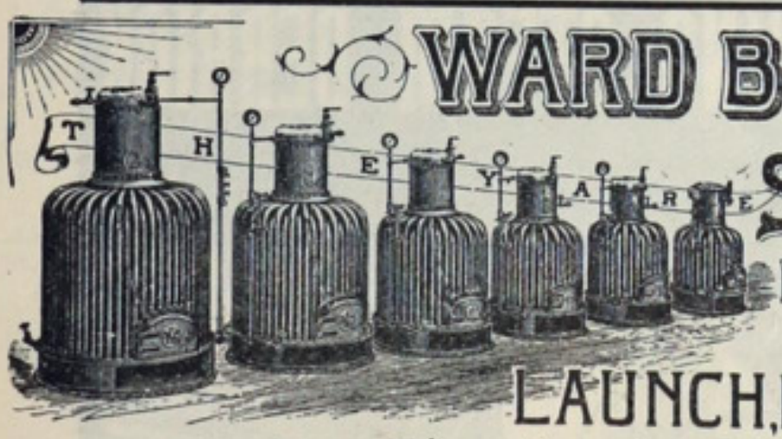

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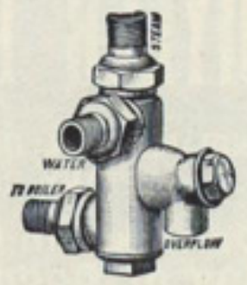

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